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Methodological Review

# A nursing perspective to design and implementation of electronic patient record systems

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**Abstract**

Achievements in informatics and use of new technologies are important to develop knowledge from clinical nursing practice. At the same time, progress in design and implementation of clinical information systems such as comprehensive Electronic Patient Record (EPR) systems can be complemented by attention to and examination of information processes as well as the health care constituencies' characteristics. In this article, selected issues and challenges related to EPR design and implementation are reviewed with a particular emphasis on those related to nursing practice and nursing leadership.


*Keywords:* EPR; Nursing practice; Nursing leadership

## 1. Introduction

The information held in an electronic patient record (EPR) system touches virtually every aspect associated with providing, receiving, developing, and reimbursing health care services. Well-managed information is one of the most important and demanded resources in clinical practice since collection, transmission, storage, and retrieval of information are crucial for most care activities. Access to information 24 h a day, 7 days a week, year round, is therefore an absolute requirement for operation and acceptance of EPR systems [1].

Although developing clinical practice and building nursing knowledge through informatics are worthy goals, progress in technical areas alone is insufficient to meet these goals. To build knowledge from clinical nursing practice, the design and implementation of EPR systems must support nursing practice. In this paper, selected issues related to EPR systems are reviewed with a particular emphasis on those related to nursing practice and nursing leadership.

Design and implementation of EPR systems represent significant challenges for the complex and multi-faceted information handling in health care. Some of these challenges are primarily technical in nature. These include: (1) reliability and stability of the EPR system, acceptable response time, guaranteed information availability; (2) evolving requirements for access to, availability of, and organization of comprehensive data and information within and across settings of varying size and complexity; (3) unresolved ability to capture, represent, retrieve, and share data in different formats from multiple sources collected over time for different purposes; and (4) inadequate understanding of formalisms, e.g., reference information models, concept-oriented terminologies, as well as EPR architecture standards, required for complex, multi-faceted information handling in unpredictable or ambiguous situations [1–5]. These challenges are being addressed at national and international levels through standards development organizations and other efforts such as those described in this issue.

In contrast, challenges related to organizational issues and human barriers, e.g., user behavior, education, and training of the staff at large, unresolved legal, and social issues, uncertain cost-benefit as well as lack of leadership, are recognized as impediments in design and implementation of EPR systems, but receive less attention [1,6–9].

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An EPR system can reshape information management, create new communication patterns, and enable development of new practice models. Consequently, there is growing interest in the EPR system's capacity to support or change practice requirements. This is likely to present challenges for design and implementation of EPR systems, for the individual health care providers as well as collaborations within and across disciplines, constituencies, and settings of varying size and complexity.

## 2. Nursing perspectives related to the EPR

From the perspectives of nursing, for EPR systems design and implementation, knowledge and insights are needed from five key areas: technology, organization, informatics, nursing practice, and nursing leadership (Fig. 1) [10].

In this paper, the key areas of nursing practice and nursing leadership are addressed.

### *2.1. Nursing practice*

In general, organizations are established, configured, and sustained to handle information processes, facilitate efficient information flow, and secure communications for sound decision-making [11,12]. In the healthcare organizations, nurses constitute the largest user-group of clinical information and hold the de facto responsibility for smooth information flow and coordination of patient-specific information. The continuous presence of nurses in most care settings and nursing's accountability for integration of patient data and information for competent clinical judgments in complex practices highlight the importance of EPR systems that support nursing practice [5,13–15].

Access to high quality information is a prerequisite for accurate judgments, evidence-based practice, and coordination of care as well as knowledge building from clinical nursing practice. Improved organization and representation of data, information, and knowledge in the EPR system is necessary, but not sufficient to support nursing practice. This must be complemented by clarification of key features of clinical practice prior to system design and implementation. Examination of nursing practice specifically related to design and implementation of EPR systems should include: (1) characteristics of nurses' work, i.e., what nurses do in the name of nursing and (2) characteristics of context of nurses' work, i.e., systems and structures where organized nursing occurs [16].

Nurses' work can be delineated as independent, interdependent, and delegated activities as nurses make judgments and initiate care and treatment based on nursing knowledge, engage in collaborative activities and integrate multiple perspectives, or carry out orders from other members of the health care team [17–20]. Variations in nurses' work may reflect patient care requirements, changing decision-making, authority, and control over performance [5,21]. Exploration of nurses' deliberation and enactment as they interpret signs and symptoms, make decisions, transfer knowledge into actions, and use universal or personal knowledge to guide activities is a key prerequisite to understanding how an EPR can support nurses' work. A well-designed EPR can improve information access, meet nurses' information needs, attend to clinical practice variation and support care delivery.

Nursing occurs in complex organizational contexts, shaped by evolving advances in care and treatment, the diversity of different occupational milieus, existing parallel hierarchies with distinct features, and intense collaborative relationships. In some aspects, nursing as a system emphasizes hierarchical, centralized control, and in other aspects nursing is highly decentralized with an emphasis on autonomy, individualized decision-making, and patient-specific clinical judgment. Emerging professional roles and traditional obligations intertwine as nursing retains a traditional centralized control and in-

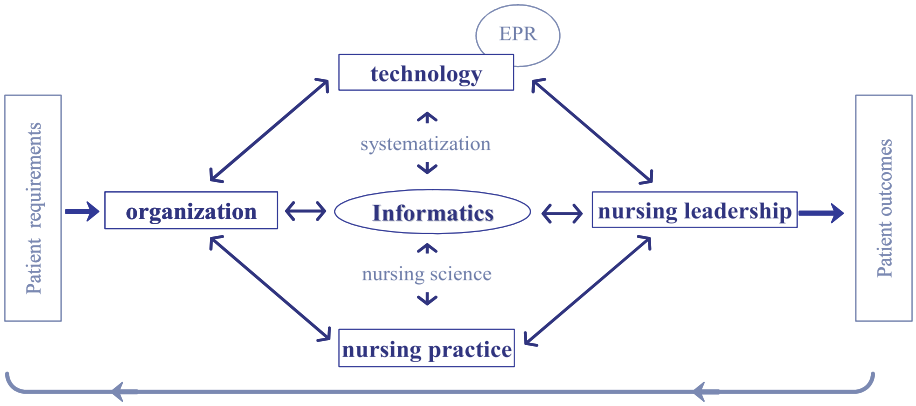


Fig. 1. Framework for EPR investigation from a nursing perspective.

corporates decentralized decision-making with situational interpretation of patient conditions and appropriate application of data, information, and knowledge [10,22].

Careful analysis of such discipline-specific issues will explicate the inherent complexity of the clinical practice the EPR systems should be designed to support. From the nursing perspectives, this includes questions such as the following: What are nurses doing that EPR could do better? How can an EPR support nurses and allow them to spend more time and resources on activities that must and can only be done by nurses? How can EPR functions lead to improved nursing care quality and patient safety? How can the EPR system contribute to build nursing knowledge?

### 2.2. Nursing leadership

Because design and implementation of EPR systems involves challenges requiring extensive collaboration across disciplines and constituencies, professional leadership is especially important. Contribution from nursing leadership related to technology implementation is perceived as vital in the design and implementation of innovations such as EPR systems [1,7]. However, in reality nurses may have little input to the requirements for design due to the fact that nursing involvement is most often in the final stages of system introduction [23–25]. Minimal attention to or lack of involvement in EPR system design and implementation by nursing leadership, in particular, is disturbing because choices made in early stages often carry important consequences related to the EPR system's impact on and inherent capacity to support nursing practice. In reality, the amount of time nurses in leadership positions spend related to their different responsibilities reflects some relative importance given to the particular activity [26].

Regardless of expectations from previous or current participation in design and implementation of technology, nurses in leadership positions carry responsibility to develop nursing practice. Nursing leadership needs to move beyond the traditional "command and control," and use their time, knowledge, experience, and skills to create visionary strategies, flexible guidelines, and improve staff nurses' performance in patient care [27,28]. Contribution in design and implementation of EPR systems is one way to develop nursing practice, and participation of nursing leadership will also provide important directions for the development processes and learning within nursing [7,29]. Therefore, nursing leadership need to overcome personal or psychological barriers to participation and allocate time to participate in EPR systems design and implementation.

Setting up processes to examine and systematize nurses' work and develop feasible structures and systems that enhance patient care are significant leadership contributions to design and implementation of EPR systems, and can ensure that the system support nursing practice [13,24,27,30]. Moreover, articulation of the activities of nursing and translation of how those activities relate to the activities of other health professionals are equally important for the design and implementation of an EPR system due to the multidisciplinary nature of patient care. However, in addition to examination of nursing practice as reviewed in the previous section, two questions can be important to nursing leadership to assist in their inquiry: (1) to what extent does the EPR system enhance decision-making and provide direct/indirect support in the ongoing interactions in nurses', physicians', and other providers' work and (2) to what extent does the EPR system ease administration of information for integration, dissemination, audit, research, and knowledge development in the clinical setting?

## 3. Concluding remarks

Design and implementation of EPR systems that support nursing practice present several challenges to nursing practice and nursing leadership. Increased, focused attention and shared understanding of the work to be supported is urgently needed to address organizational issues, overcome possible human barriers and make sure the EPR systems support nursing practice. This can be an excellent starting point to advance informatics' contribution to nursing knowledge development. Active participation to examine clinical practice, e.g., focusing on variation in structure and process, types of knowledge in use, and methods of inquiry, as discussed in this paper, are important to design and implementation of EPR systems [31,32]. From the nursing perspective, it is important to examine and communicate characteristics of clinical nursing practice and provide leadership so the EPR systems truly support nursing practice, promote patient safety and assist in knowledge development in the clinical setting.

Although there exists numerous unresolved issues, there is a window of opportunity for nursing in design and implementation of comprehensive EPR systems. Herein lies an invitation to analyze characteristics of nursing practice and to explore ways to develop clinical practice to accomplish quality care in creative and innovative ways if challenges beyond the merely technical ones are identified and addressed [10].

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